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ABSTRACT

Presented are suggestions written to help local school districts develop an energy conservation program in order to minimize budget problems brought about by rising energy costs. Program areas covered include formation of the district energy conservation team, assignment of duties, operation of energy audit systems, and evaluation procedures. To illustrate these recommendations, a sample energy management program is described. In addition, this publication contains over 100 suggestions for reducing energy consumption through various administrative, operational, and equipment purchasing procedures. (WB)

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ENERGY CONSERVATION GUIDELINES

1 District Level Plan for Conservation

ED194355

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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DISTRICT - LEVEL PLAN FOR CONSERVATION

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Commissioner of Education

Prepared under the direction of the
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FOREWORD

Prior to 1966-67 school districts spent about three percent of their annual budgets on utility bills. In 1976-77 expenditures rose to between six and seven percent. Rapidly rising energy costs at a time when the legislature imposed budget caps on all spending, resulted in reductions in educational programs and services in many school systems. Anticipated additional increases in energy costs in the years to come will result in further decreases in expenditures for services and educational programs *unless* school systems can find ways to reduce the consumption of energy.

School systems which have taken advantage of energy audit recommendations have reduced costs by as much as 25-50 percent, thus avoiding the serious cutbacks employed in many school systems.

There is no single format for an energy conservation program which adequately will fill the needs of all school districts. There are too many variables involved from one region of the state to the next. In the process of reviewing a number of conservation programs there are several features that are shared by all successful conservation efforts. These include:

a) the formation of a district energy conservation committee or team which involves as many segments of the educational community as possible,

b) the assignment of specific responsibilities to specific individuals,

c) careful planning in the development of guidelines,

d) the recording of energy use patterns – an *energy audit* – for each building in the district and

e) persistent follow-up and evaluation efforts to see that established guidelines are followed.

This booklet updates one published in 1975. It is written to assist local school districts organize their energy conservation efforts to maintain vital services and programs and, at the same time, provide the healthful, safe and comfortable physical environment necessary for schools.

Irving M. Peterson, Director
Facility Planning Services

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THE DISTRICT ENERGY CONSERVATION TEAM

Any conservation effort, if it is to be successful, must have the cooperation of all elements in the educational community. The size and composition of the team will vary according to the needs and aims of the school district involved. A typical energy conservation team from a large school district might involve the following persons:

- The superintendent or his representative
- Building principals or their assistants
- A district energy manager (a person assigned the specific task of administering the energy conservation program)
- A representative from the board of education
- Teachers
- Students
- Maintenance and custodial staff
- Food Services personnel
- The district business manager
- A representative from the Parent Teachers Association
- A representative from the utilities company serving the district
- Outside professionals such as architects and architectural engineers
- Transportation staff

It is suggested that the selection process for this committee be conducted thoroughly and carefully. Persons selected should be sincerely interested in the project and there should be a reasonable expectation that they will actively participate.

It is very important that the district superintendent be "visible" in all phases of the program, either through his representative or, preferably, in person. The presence of the superintendent lends the sense of direction and purpose to the conservation effort. It is important also that one person be selected as team leader.

PLANNING FOR THE DEVELOPMENT OF GUIDELINES

There should be ample time set aside for the planning phase of any conservation program. Participants should be notified well in advance of the time, place and purpose of the planning meeting. An agenda should be prepared well ahead of time. If the scope and intent of the program warrants, more than one meeting may be necessary. Organizers should not be discouraged if this planning phase seems to be eating up time. A successful conservation program is founded on careful planning and well-thought-out procedures.

The following are some suggested agenda items that might be explored during the planning and organization meetings of the conservation team.

- The assignment of responsibilities and tasks to specific groups and individuals.
- A thorough review of the district's energy situation.
- Strategies which involve the entire educational community.
- The planning of an energy audit for the school district.
- The formulation of evaluation and follow-up procedures.
- The setting of goals and the establishment of time-frames for the achievement of those goals.
- The planning of a public information program to inform district personnel and the community about the existence of the project and its goals.
- The preparation of energy conservation checklists for district and school building use.
- The possibility of consulting outside experts in the field of energy management.

SPECIFIC DUTIES FOR SPECIFIC PEOPLE

Implementing the guidelines drawn up by the conservation team cannot be left to chance or the good intentions of program participants. Conservation programs are effective only when specific tasks are made the responsibility of specific individuals. Moreover, it is important that each member of the district team be aware of the person responsible for specific duties. Wherever possible, there should be some system that insures that persons indicate in writing that their task has been completed.

THE BUILDING ENERGY CONSERVATION TASK FORCE

For best results each school building should have a task force to implement the district energy conservation guidelines and programs. This task force should consist of the building principal, teachers, custodians, secretaries, students and parents. Not only should this task force act to implement the district-level programs, but it also should formulate suggestions on how the district-level plan can be improved. In order to best monitor energy use in each building the building task force should become acquainted with all available energy use and cost data for the building as well as the basic operating procedures and monitoring techniques involved in the various building systems. As buildings are audited for energy use, the task force will have additional data upon which to base its actions and recommendations to the district office.

AN ENERGY AUDIT SYSTEM

The Energy Audit System involves developing a record of the energy use patterns in each building in the district. (Not just schools but garages, storage areas and administrative buildings as well.) The Energy Audit is an indispensable tool in any conservation program and serves the following purposes:

1) It shows where energy money is going and therefore pinpoints areas where energy savings are possible by providing monthly energy cost comparisons.

2) It makes possible the preparation of an "energy budget" so that administrators can begin to think of dollars and BTU's in the same terms.

3) By showing graphically where energy costs are concentrated, it encourages students, teachers and administrators to try harder to cut energy waste.

A school district should attempt to collect a base amount of information on each of its plants. At the very least this should include

1) the type and amount of each fuel used,

2) the amount of electricity used and

3) the peak demand level for electricity.

District personnel may meet with some initial difficulty in establishing the history of a plant's energy usage. Records may not have been properly maintained or may be difficult to locate. But, as information gathering techniques become more advanced, the audit procedures will yield more useful information such as energy dollar cost per student, per plant, per square foot, etc.

It should be mentioned here that very often the utilities company serving the school district will offer its help and cooperation in conducting Energy Audits and usage measurements. In some regions this service is provided free of cost to the district.

Frequently, energy use is translated into an Energy Use Index which is expressed in Btu/sq.ft./year; this can provide a convenient means of estimating the energy efficiency of a facility. The General Services Administration suggests a target value of 75,000 Btu/sq.ft./year for existing buildings and 55,000 for new buildings. Schools range from 75,000 to 500,000. In this approach, energy use data is tabulated and compared with the above standards.

A walk through audit is often used to collect information for recommendations on how energy can be saved through minor modifications to the building and/or its equipment or through revised operations. This is usually followed by a more detailed audit by an engineer to gather information regarding the facility's characteristics, energy using systems, energy use patterns, operating parameters and local weather information. The end result is an energy use profile.

To encourage school officials to conduct these vital audits in 1977 the federal government enacted a National Energy Act. Under this act, funds were made available to the states to implement an energy audits program and to provide technical assistance for more detailed audits leading to retrofitting (making physical changes for purposes of improving energy use efficiency in buildings). To implement this act, New Jersey is using the services of the Center for Technology Assessment at the New Jersey Institute of Technology. Training sessions for conducting preliminary audits are followed by audits, technical assistance for more detailed audits (for those shcool districts with the greatest potential for savings), and matched grants for building modifications (for buildings which can benefit most from such changes). New Jersey school officials interested in this program should contact the State Department of Energy (201-648-3901).

FOLLOW-UP AND EVALUATION PROCEDURES

Even the best of programs tends to lose momentum with time. Follow-up efforts should be planned in order to overcome any tendency to slow down. This can be managed in a number of ways but it is essential **that people, not just paper,** be involved in this process. For example, a letter from the superintendent urging principals to step up their conservation efforts is not half as effective as a constructive visitation from a district maintenance team to identify energy consumption problems and correct them. These visitations, should be done in the spirit of rendering assistance and should not be undertaken to pose a threat to the school's principal or its maintenance and custodial staff. It is important that all district personnel involved in the project feel they are working together for a common goal.

The material accumulated as a result of the Energy Audit will, of course, provide an excellent data base for making comparisons and evaluations. But it should be noted that some disagreement exists as to whether the results of the monthly Energy Audits for district plants should be published. Those who argue negatively say this procedure promotes hard feelings on the part of administrators whose schools have not done well in energy conservation efforts. Those arguing in favor of making these monthly audits public say that this stimulates the desire to conserve energy and encourages a spirit of competition. Many school districts which publish the results of their audits have found that, overall, the publication of results has had a positive effect.

CHECKLISTS VS. SUGGESTIONS

In consulting this section the reader should bear in mind the distinction between a "checklist" and a "list of ideas."

In terms of an energy conservation program, a "checklist" sets out a list of duties for which some person is specifically responsible. In other words, a checklist is meant to be "checked off" by someone whose job it is to take care of the items in question.

The list of ideas included here may be altered or restructured so as to produce a checklist. If this is intended by organizers of a conservation program, they should remember that, to be effective, a checklist should have at least some of the following characteristics:

1) The checklist, wherever possible, should bear the names or titles of those responsible for performing the duties on the list.

2) The list should include a space for a signature (note: a signature, not just a check mark) and, where applicable, a place to indicate the time and date when the item was taken care of.

3) Checklists, wherever possible, should be kept in a convenient and permanent location (i.e. for a transportation checklist, the bus garage; for a maintenance list, a place where the appropriate personnel are regularly located).

4) Checklists should be collected and reviewed on a regular basis by supervisory personnel.

A word of caution: The literature of energy conservation in school facilities is glutted with so-called checklists. One gets the distinct impression that too often school administrators fool themselves into thinking that simply by handing down checklists, energy consumption will drop magically. Nothing could be further from the truth. Checklists are merely one means to an end, and, in order to be effective, they must be used properly. To repeat a point made earlier, successful programs are carried out by people, not paper. Responsibility for the handling of the checklist must be delegated and there must be some administrative mechanism to insure that this responsibility is carried out.

ENERGY CONSERVATION SUGGESTIONS

The following items are **suggestions.** Not all of these ideas will be practical or necessary in every situation:

Administrative

- Discontinue summer school — using a school on a year-round basis, with air conditioning in the summer, generally adds over 60 percent to annual electric bills.

- Extend Christmas vacation an extra week; this can result in a 5.8 percent annual fuel savings.

- Closing schools during cold weather will reduce the amount of energy consumed by the schools (up to 24 percent), but may increase a community's total energy use. It is best to use conservation measures and remain open.

- Start school 11 a.m. and keep open later in the afternoon; this could save five percent of the annual heating costs. Starting at 10 a.m. would save only about 2.5 percent.

- Use centralized meeting places and combine meetings to allow personnel to travel together. Hold board meetings and PTA meetings during daylight hours where possible.
- Schedule adult education programs to meet in rooms which receive full use during the day to utilize the existing room heat.
- Schedule all evening meetings, PTA and others, for a single building so that night setback temperature can be retained in other buildings.
- Eliminate or reduce nighttime activities that require lighting.
- Eliminate night football games whenever possible. When this cannot be done reduce the lighting during half-time and before the game.
- Discontinue community use of showers.
- Match facilities to group size. Do not assign rooms or buildings that are too large.
- Design and print attractive, eye-catching signs about energy conservation and put them in strategic places.
- Coordinate shop and classroom use for more efficient utilization of space in shop area.
- Restrict use of doors in shops.
- Design activities for more efficient use of multi-purpose rooms.
- Use regular classrooms more when small drama groups are practicing or performing.
- Utilize more community and business facilities for training.
- Limit the geographical area of athletic competitions to reduce traveling by bus or car.
- Conduct basketball, volleyball and other game practice sessions outside, as much as possible and during daylight hours.
- Combine girl's and boy's sports, as much as possible, to reduce the number of hours facilities are used.
- Make warehouse deliveries and messenger service to schools on a very minimal basis.
- Reschedule room cleaning to daytime as much as possible to save electricity used at night.
- Use a central place as point of embarkation for trips involving a number of people.

- Coordinate conferences out of district for sharing rides.
- Coordinate trips. Personnel who serve a number of schools should plan on coordinating trips to include maximum contracts and include other district personnel serving the same schools.
- Pick an area for staff meetings which requires the least amount of driving for all concerned. Insist on car pools.
- Limit the number of entrances students and teachers use for arrival and departure.
- Consolidate summer school classes in adjacent rooms, where possible, to reduce the number of air-handling units needed. Place classes around the perimeter of the building to take advantage of natural ventilation and natural light through windows.
- Encourage more efficient use of AV equipment through large group viewing.
- Make sure that all power equipment in each instructional room is turned off when not in use.
- Discontinue the use of electric scoreboards.
- Monitor use of all vehicles used in maintenance and operation.
- Ration gas for all equipment. Make it stretch.
- Control purchasing of equipment to obtain the correct size.
- In homemaking rooms, cook by time and temperature for best results; use timer for precise cooking operations.
- Decrease the amount of hot food prepared.
- Open oven doors no more than necessary to check on foods being prepared.
- Keep pots and pans covered while cooking.
- Make sure burners are completely off when not in use.
- Use a stopper in sink when washing dishes by hand, to avoid running hot water continuously.
- Match pan size to burner unit size.
- Keep refrigerator and freezer more than half full – items absorb and help hold cold.
- Use high heat only to bring water to a boil or to start cooking food with water, and then reduce heat level to lowest possible point.

- Use small amounts of water whenever possible to heat faster.
- Consolidate baking activities into one day of continuous use.
- Use hood fans only when necessary.
- Eliminate the use of electric can openers and other "convenience" appliances.
- Use cold water washing when possible.
- Avoid blocking, heating or cooling vents with furniture or draperies. Do not put anything on top of radiators. Keep all heating sources clear of furniture, draperies, bookcases and files.
- Encourage employees and students to bring their lunches rather than drive home or go to a restaurant.
- Curtail use of resistance-type electric equipment, such as space heaters, coffee pots and hot plates.
- Use both sides of all paper products.
- Close all drapery, curtains and blinds at the end of each school day.
- Reassign teachers and clerical workers closer to their homes.
- Coordinate transportation with other county agencies.
- Educate all workers to ask themselves before taking a trip: Can I deliver or do something for someone?
- Encourage the wearing of warmer apparel during cold weather.
- Work with city and county planners to provide bicycle lanes. Provide adequate and safe parking areas for bicycles at schools and offices.
- Lock gas tanks on all vehicles to avoid theft.
- Allow sunlight into the building on cold days and keep it out on warm, humid days. Close drapes and blinds after school to reduce heat loss through window areas in the winter and to keep solar heat out during the summer.

Operational

- Establish the proper balance between temperature and humidity controls.
- Have heating and air conditioning systems balanced regularly so that hot and cold spots in buildings are reduced to a minimum.
- Shut off or put on night setback all air-handling equipment one-half hour before school closes. The building will maintain temperatures for a long period of time after controls have been shut off or reduced.

- Set thermostats at the lowest setting that will not interfere with the learning process. Reduce heat in gymnasiums, locker rooms and auditoriums. Eliminate heating in unused rooms such as closets, stairwells, etc.

- Set back thermostats during weekends and vacations. Provide for overnight setback of thermostats either manually or by automatic control.

- Lower thermostat settings where they exceed federal guidelines. Each degree Fahrenheit lowered saves three percent of the fuel expended during heating.

- Use night setbacks to lower the thermostat setting to 65°F. After 3 p.m. and raise it at 6 a.m. to the normal daytime setting in winter.

- Keep exterior lights off during the day; photoelectric switches can control this automatically.

- Shut off air-handling units and lights in gyms when physical education classes are being held outside.

- Reduce lighting to levels actually needed in instructional areas.

- Restrict use of showers to the very minimum. Reduce the capacity of shower heads, to cut down on the amount of hot water used. Reduce water temperature in showers.

- Lower temperatures in water heaters on weekends; turn off during vacations.

- Lower swimming pool temperatures, and minimize filter pumping hours on pools.

- Do as much cleaning as possible with cold water.

- Adjust temperature in buildings where custodians work, to the lowest possible comfortable temperature for physical labor.

- Use the minimum amount of water for sprinkling and irrigation.

- Keep all gas burning engines in district vehicles tuned to peak performance.

- Schedule major electrical power-consuming operations such as pumping water into storage tanks during off-peak hours.

- Monitor utility bills very carefully. Use computers to obtain daily readouts of fuel and electricity consumption. If no computer is available, monitor all meters closely. Operating costs should not exceed between three and four times as much as maintenance.

Staff Utilization

- Instruct custodians and maintenance personnel to turn off lights and HVAC system in local areas as they finish their work; by doing this electric power consumption can be reduced 15 to 20 percent.

- Make sure custodians understand how to operate temperature settings on unit ventilators so they do not confuse the low-limit settings on these units with actual thermostat settings and overheat the room.

- Establish inservice training programs for custodial and maintenance staff, featuring experts in the field of thermostatic control and lighting and manufacturing representatives who can give instruction in operating pieces of equipment at maximum efficiency. Bring operations people up to the level of skill demanded by the equipment and controls.

- Recognize that operations and maintenance are two separate functions. Do not expect untrained, unskilled personnel to repair and maintain sophisticated equipment.

- Organize work crews better to reduce travel.

- Organize groundsmen and maintenance personnel assignments to minimize use of trucks. Equip maintenance trucks with all necessary tools.

- Cut grass and edge less often.

- Develop innovations and creative programs to encourage staff to walk to school or ride bikes.

- Provide assistance in developing car pools for teachers and clerical workers in schools.

Curriculum

- Make sure that energy conservation as a subject area has a place in the school curriculum.

- Use conference telephones as substitutes for small meetings.

- Use closed circuit television for meetings.

- Initiate useful projects in shops to help other departments in the school with equipment, repairs, etc.

- Organize more hand operations, especially in crafts.

- Reduce hours of kiln use in art classes.

- Restrict the use of electric typewriters and other electric machines. Use more hand-operated equipment.

- Use more hand tools in shop classes, teach more hand skills and assign more students per power work station.

- Limit preheating of ovens to the very minimum in homemaking classes. In some cases, preheating is not necessary.

Maintenance Procedures

- Be sure all windows fit tightly. Seal all openings around windows, doors and other places where warm air could escape. Caulk old frames. Patch broken windows and damaged doors immediately. Double glaze windows, especially those on the north side.

- Repair all equipment immediately, and establish routine maintenance schedules. Have all ovens in homemaking rooms calibrated.

- Keep refrigerator and freezer coils clean.

- Don't allow leaky hot water faucets. Locate and repair any water or steam leaks immediately.

- Make sure that lamps and reflectors are kept clean. Dark colors and dirt can reduce illumination by as much as 40 percent.

- Keep chimneys clean. For each one-eighth inch layer of soot, fuel consumption is increased by eight percent.

Equipment Selection

- Replace fluorescent lamps when 20 percent of their life expectancy remains. More energy is used and less light produced during this time.

- Replace all outdoor and gymnasium lights with mercury vapor lamps. Use diffusers, new lens, polarizers and special beam distributor units that can provide proper spread, focus and use of illumination within a given space.

- Survey location of each room thermostat in relation to doors, windows and hot or cold sources. Relocate for maximum energy savings.

- Replace hand valves on heating and air conditioning equipment with thermostatically-controlled automatic valves.

- Replace door seal when it no longer seals tightly.

- Reduce stage lighting through the use of dimmers. Use less and lower light during rehearsals.

- Reduce the number of forges, kilns and smelters in shops.

- Install automatic door-closing devices.

- Reduce the size of freezers to minimize on-site storage of frozen foods.

- Explore the possibility of using solar and other "alternate" sources of energy in new and existing facilitiess.

- Use solar heat for pools. Do not heat pools during warm or hot seasons of the year.
- Redesign, remodel or replace obsolete or inefficient equipment.
- Develop specifications for purchasing new equipment to insure that it is designed to use the minimum amount of energy within the requirements of performance, longevity and maintenance.
- Carefully develop specifications for the purchase of new equipment to insure that it is designed to use the minimum amount of energy.

SAMPLE ENERGY MANAGEMENT PROGRAM

A good Energy Management Program is essential and should coordinate and control a district's acquisition, use and distribution of energy. It should also help create and sustain an energy conservation awareness among students, staff and the public at large. Essential ingredients for the program are an energy data management information system, a building analysis system and a means of evaluating new construction and rehabilitation in light of value-engineering and life-cycle costs. Energy use must be monitored and controlled, and the public kept informed of the results.

1. The board of education and school administration adopt a **preliminary energy management program** to include a commitment to energy efficiency and alternative courses of action; ". . .energy conservation is not a 'one-shot deal' but a year-round concern."[1]

   > "Successful energy conservation programs in use around the country... have some common characteristics: commitment of board and administrators; an energy conservation plan; district and school level committees or teams to implement the plan; a means of analyzing school buildings . . .; motivation; review and revision of the plan as needed; and recognition of successful conservation efforts."[2]

2. A **district-wide energy conservation team** is formed to include:

   a. A district energy coordinator

   b. All building principals

   c. The chief school administrator

   d. The district business administrator

   e. Student representatives

   f. The district maintenance and custodial staff supervisor

g. The transportation staff supervisor

h. Representatives from among the teachers, board of education, food service personnel, parent-teacher associations, utility companies and curriculum specialists

i. Outside professionals such as architects and/or engineers

The district team's main responsibilities are planning, recommending, coordinating, evaluating and publicizing the district's energy management program.

3. Each school **building** forms an **energy task force** made up of administrators, teachers, custodians, secretaries, students and parents to implement the district-level energy guidelines and programs, under the direction of the building principal. Each task force member is given specific duties which involve passing on information, recommendations and policy decisions and implementing specific energy-saving measures. Also, each task force member should make suggestions about further energy-saving measures and provide feedback about the success or failure of those measures being implemented.

   All task force members must be educated about district and school energy use and cost data: some members should learn about conducting mini-audits and analyzing the results of maxi-audits. Also, it might be valuable for task force members to learn the basic operation of the various mechanical systems in the building and how to read and record meter readings to best monitor energy use in the building. Room utilization data is also essential.

4. **Audits** are conducted for each building.

   a. First, an analysis is made of energy use data. This may be done in two ways:

      (1) By converting the annual energy used in a school into Btu's (a measure of heat, the British thermal unit) using the following table;

Form of Energy	BTU Equivalent
1 Kilowatt-Hour	3,413 BTU
1 Pound of Steam	1,000 BTU
1 Ton of Coal	25,000,000 BTU
1 Barrel of Oil	5,800,000 BTU
1 Gallon of Gasbline	125,000 BTU
1 Gallon of #2 Fuel Oil	140,000 BTU
1 Gallon of #6 Fuel Oil	149,000 BTU
1 Cubic Foot of Natural Gas	1,031 BTU

1 Kcf of Natural Gas	1,031,000 BTU
1 Therm of Gas	100,000 BTU
1 Cord of Wood	20,000,000 BTU

and adding these values for all energy use sources in the building, it is possible to calculate the total annual energy use of a building. Dividing this total by the total floor area of the school produces an "Energy Use Index" expressed in Btu's per square foot per year. The General Services Administration has suggested that no facility should exceed 75,000 of these units. (New facilities should be designed to use a maximum of 55,000 Btus/sq.ft./year. Most existing schools fall into the range of 75,000 to 500,000 Btus/sq.ft./year.)[3]

(2) By using the Public Schools Energy Conservation Services (PSECS) of Educational Facilities Laboratories any school may be compared with a computer simulation model of an energy efficient school of the same type. Data for this analysis must be supplied by the local school districts. This (modified) is now a significant program in New Jersey since all school districts who desire some of the federal aid for schools under the National Energy Act must begin by having this analysis made. For information regarding how to participate in this preliminary audit (which can be done without cost to local school districts), contact Mr. Frank Monachello, New Jersey Department of Energy (201-648-3901). Mr. Monachello can also provide information on future grants for detailed audits and retrofit projects.

b. Second, a "walk-through" (or mini) audit is made to collect information and make recommendations on how energy can be saved at little or no cost through minor modifications in the operation and maintenance of a building. Participants should include, where possible, an engineer who is familiar with heating, ventilation and air conditioning systems; a technical person from the gas, electric and/or fuel company; the chief operating "engineer" for the building; the building principal; and others from the building task force as desired.

> "When the Mini-Audit report has been prepared, it is presented to school personnel. It contains many energy conservation measures that are, for the most part, quickly and easily implemented by operating personnel. Experience has shown that administrators and operating engineers are generally eager to receive the results of the Mini-Audit. Mini-Audit reports have proven to be a useful tool for implementing a variety of no-cost and low-cost conservation measures and they also have the ability to give an indication of the need for a more extensive maxi-audit."[4]

c. Third, a detailed (or maxi) audit is made to establish an "energy use profile" regarding specifics of the building's physical characteristics, energy use systems, energy use patterns and operations as they relate to local weather data.[5] A maxi-audit is "a thorough study of the physical plant, its operating systems, use patterns and historic energy consumption

data to determine the potential for energy savings."[6] Computer simulation provides more comprehensive results than manual computations; this should be considered at the time the necessary professional consulting engineer or architect is retained. The contract should call for a thorough analysis of current energy use in a school building and specific recommendation of measures that can reduce energy consumption in the building. The consultant's report should differentiate between no cost, low cost and high cost measures (pay back within ten years, and longer pay back items). In the area of retrofit or capital modifications, priorities should be established with the most cost-effective measures listed first. Suggested energy cost saving measures are included in booklet #2. It is generally considered best, from the standpoint of overall energy consumption, for schools to remain open provided they implement the kinds of energy cost saving measures which are being recommended here.

5. Incorporate the above into each school's **operational procedures and maintenance program.** Keep operating costs to less than four times the cost for maintenance. A good energy management system requires the close monitoring of energy consumption. Computers can be used effectively to obtain daily readouts of fuel and electricity consumption.

6. **Budget** the necessary funds to make low cost, medium cost and high cost energy saving measures (see booklet #2). Plans and specifications for all physical changes to a building must be reviewed by the Bureau of Facility Planning Services before proceeding with the work.

7. Include **Life-cycle energy-related costing** in planning new facilities and in purchasing new equipment.

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[1]Division of Building and Construction. Energy Conservation For State Buildings (Trenton: New Jersey Department of the Treasury, D.B.C., 1978), p.2.

[2]American Association of School Administrators. School Energy Crisis: Problems and Solutions (Washington, D.C.: A.A.S.A. 1977), p.51.

[3]James E. Piper, "The Energy Audit: What It Can Do For Your," American School and University, Vol. 50, No. 6 (March, 1978), p.58.

[4]Council of Educational Facility Planners, International. Energy Sourcebook for Educational Facilities (Columbus: CEFPI, 1977).

[5]Piper, op.cit., p.60.

[6]C.E.F.P., op.cit.

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